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SPECIES LIFE HISTORY AND HABITAT REQUIREMENTS

DABBLING DUCKS

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DABBLING DUCKS (Tribe Anatini)

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DABBLING DUCKS (Tribe Anatini)

A. Introduction. The term waterfowl, as commonly used, includes the ducks, geese, and swans. In the generally accepted classification, these birds are grouped into a single family, the Anatidae, and further subdivided into two sub-families, the Anserinae (swans, geese, and whistling ducks) and the Anatinae (ducks). The ducks are subdivided into several tribes (Delacour, 1954, 1956, and 1959).

Two tribes of ducks, the Anatini or dabbling ducks and the Athyini or diving ducks, include most of the economically and numerically important species. A few obvious characteristics of these two groups readily permit their separation, either in the field or in the hand.

The body contour while the bird is sitting in the water is quite distinct between the two groups. The dabblers appear to sit high on the water with the longer tail feathers tipped away from, or at least parallel to, the water's surface. The divers provide a much lower profile, and with shorter tail feathers give the appearance of the back sloping down to the water's surface.

In taking flight, the dabblers leap immediately into the air. The divers have a take-off pattern which carries them along the water's surface with a pattering motion.

While feeding, dabblers tip to reach submerged food while the divers commonly go well below the surface. Ducks observed feeding in grain fields will be of the dabbler type. The dabblers have legs near the center of the body, considerably farther forward than on the divers--an adaptation permitting the utilization of upland habitats.

In the hand the two groups can be separated easily by examining the hind toe. This is a slender structure on the dabbler, but possesses a definite lobe on the divers.

The feeding habits of the two groups frequently are reflected in the habitat chosen during migration. The dabblers prefer the shallow, smaller lakes and rivers. The divers frequent the larger, deeper, more open bodies of water.

Several field guides are available which provide detailed descriptions useful for species identification. Two of the more popular ones are "A Field Guide to Western Birds" by Roger T. Peterson and "Birds of North America - A Guide to Field Identification" by C. S. Robbins, B. Brunn, and H. S. Zim. Most of the state game departments, under the guidance of their respective Flyway Council, have issued an easy-to-use pamphlet on waterfowl identification. The U. S. Fish and Wildlife also published a useful guide in 1963 entitled "Ducks at a Distance" which is available from the Superintendent of Documents.

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All sources used to compile the following life-history data are listed as "Selected References." However, much of the information presented might be classified as general knowledge to people working in the waterfowl field; as such, a specific source is not cited in all cases.

B. Importance. The dabbling ducks, also referred to as surface-feeding or puddle ducks, include 11 species commonly recognized as breeding in North America. Of these, the mallard, pintail, gadwall, American widgeon (baldpate), shoveler, blue-winged teal, cinnamon teal, and green-winged teal will be considered in some detail.

Within this tribe are found many of the numerically important duck species and those most sought by hunters. Eight species of this group were among the ten harvested most heavily in the United States during the 1969 season (Croft and Martin, 1970). Blue-winged and cinnamon teal were treated as one harvest species in this compilation.

The sale of duck stamps in the United States provides some insight into the importance of waterfowl as game species. Duck stamps were first placed on sale under the Federal Migratory Bird Hunting Stamp Act in 1934. Approximately 635,000 stamps were sold the first year and in 1955 a peak number of about 2,400,000 stamps were sold. Fluctuations below this peak have reflected somewhat the more restrictive seasons of the 1960's (Anon, 1970). In addition to the hunting value of waterfowl, a rapidly increasing number of people are gaining recreational benefits simply from observing and photographing these birds.

C. Distribution. The main waterfowl producing areas in North America are shown in Illus. 1. In the center of the continent is the prairie pothole region which includes parts of Montana, the two Dakotas, and Minnesota in the United States and portions of Alberta, Saskatchewan, and Manitoba in Canada. This segment of the waterfowl breeding area, although making up only about 10 percent of the total waterfowl breeding area in North America, provides the breeding habitat for over 50 percent of all the ducks. Of equal significance is the fact that 70 to 80 percent of all the mallards and pintails are produced there (Munro, 1963).

The major breeding and wintering ranges of the mallard, pintail, gadwall, American widgeon, shoveler, blue-winged teal, cinnamon teal, and green-winged teal are presented in Illus. 2 through 9, respectively (Kortright, 1943).

The mallard, pintail, and green-winged teal show the greatest overall breeding distribution, and the American widgeon, blue-winged teal, and the shoveler only slightly less. Like the blue-winged teal, the gadwall does not extend its breeding range as far north as the other

ducks, but differs by not extending as far east. Of the eight species of dabbling ducks considered here, only the cinnamon teal (which is primarily a western counterpart of the blue-winged teal) does not show the close relationship between its breeding range and the prairie pothole region.

In spite of the predominantly western breeding distribution of these ducks, wintering birds of six of the eight species range across the southern coasts of the United States to the eastern seaboard. The blue-winged teal winters farther south than any other North American duck, many reaching the northern portions of South America.

The wintering distribution of certain species of waterfowl is shifting as major habitat modifications occur. The creation of large bodies of water which remain open during the winter has held some waterfowl, particularly mallards, farther north than previously. In addition, the continued destruction of wintering habitat in Mexico has reduced the numbers wintering south of the border.

D. Habitat. The extensive movements of ducks necessitate the use of various habitats to accommodate such seasonal activities as breeding, migration, and wintering. Of prime importance is the breeding or production season, when the habitat requirements are more demanding and specific than at other times of the year. In fact, the quality and quantity of breeding habitats largely determine the waterfowl production for any given year.

The optimum breeding habitat for most ducks is the prairie wetland or pothole region (See Illus. 1). Munro (1963) described this area as consisting of two major ecological types: the grasslands lying to the south and the aspen parklands to the north and east. This "knob and kettle" country in a wet year provides an abundance of water areas of great diversity, both in terms of size and permanence. Ducks tend to space themselves during the breeding season and, therefore, an abundance of small ponds, rather than an equal acreage in a single body of water, permits a greater dispersal and consequently a greater density of breeders.

The importance of small pond size is indicated in two major production areas, Saskatchewan and North Dakota, where the average wetland area is one and two acre(s), respectively (Shaw and Crissey, 1955). In addition to countless small temporary and semi-permanent ponds, the prairie area also provides larger, more permanent bodies of water which are used extensively for the rearing of older broods. Munro (1963) pointed out that similar conditions with respect to water distribution and pond size also are found farther north in the extensive sub-arctic areas. These areas, however, do not have the high productivity found in the prairie types farther south.

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Agriculture and ranching are the two major land uses in this prairie region. Intensive agricultural use of the pothole region in the United States has severely reduced the breeding habitat. Ranching seems to be more compatible with waterfowl production; stock pond construction in and adjacent to this pothole region may compensate in a small degree for drainage and extend the boundaries of the major production areas.

Dabbling ducks continue to use essentially the same types of habitat outside the breeding season as well, but certain differences are worth noting. In late summer and fall, as the duck's molting progresses and the birds concentrate for the fall flight, the larger bodies of water become important resting and feeding areas. This modification in habitat selection remains evident throughout the fall migration and during the wintering period, depending on the region and the size of the waterfowl concentrations. Concomitant with this change is the extensive use of grain fields and other cultivated areas for feeding. Indeed, the locations of these agricultural food sources are important locally in directing and holding waterfowl (especially certain species of geese and dabbling ducks) during that portion of the year.

In a wetland inventory of the United States, Shaw and Fredine (1956) identified 20 types of wetlands. Of these, 11 were judged to be of prime importance to waterfowl--essentially, open waters with emergent, non-woody vegetation, and marshes with interspersed openings.

E. Life History. The general sequence of seasonal activities occurring in the annual cycle of a surface-feeding duck is presented in Illus. 10. The specific dates involved will vary from year to year, area to area, and between species, although the general time element in this illustration most nearly represents the mallard in the prairie wetland region.

1. Courtship and Breeding. North American surface-feeding ducks are considered monogamous, with a pair bond formed between a single male and female, at least for a given clutch. Some individuals initiate pair formation on the wintering grounds; and others, enroute to the breeding grounds. Many different types of courtship chases have been described. Johnsgaard (1968) has concluded that two major types exist. The first usually occurring early in the season, is a courtship flight where one hen may be chased by two to several drakes --an extension of the courtship behavior taking place on the water. The second, usually occurring later in the season, is termed a pursuit flight and results when a strange male lands near a mated pair. The intruding drake may be attacked and chased by the mated drake alone, or the hen may be forced into flight by the intruder and the chase then becomes a three-bird affair.

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Territorial defense against others of the same species which tends to disperse the nesting pairs is the general rule among ducks. Hockbaum (1944) listed four requisites for the nesting territory of prairie breeding ducks: namely water, a loafing spot, nesting cover, and food. Some initial waterfowl studies defined territories as having rather rigid boundaries. Succeeding studies have redefined territorial boundaries as being more flexible, particularly in some species. Exacting limits as to what actually is defended in a duck territory is somewhat in question, but there seems little question that defense exists and that dispersal of pairs throughout the habitat is the end product.

In most of the species, the male leaves the female shortly after incubation starts. The length of time that a drake remains with the female varies between species. The shoveler male remains until late in incubation (McKinney, 1965). If the clutch is destroyed or abandoned after the male has left, a female will seek out a new mate and initiate a second clutch. The so-called "surplus" males often observed in a breeding area thus serve a function in renesting attempts (Elder, 1954).

After breaking the pair bond males gather into groups, usually on larger bodies of water which provide greater security. Here they go into the post-nuptial or "Eclipse" molt. Unlike most birds which replace flight feathers gradually and maintain the power of flight, ducks drop all the flight feathers simultaneously. During this flightless period, the drakes also assume a drab plumage, much like that of a hen of the same species. The later replacement of flight feathers is accompanied by a second molt of the body and tail feathers, in which a partial replacement of the more colorful plumage occurs.

2. Nesting. Dabbling ducks generally build their nests on the ground in upland areas, although the mallard shows considerable adaptability by occasionally nesting in marshy areas or even in trees (utilizing abandoned crow or hawk nests). All of the species frequently nest in close association to water but several--notably the pintail, gadwall, American widgeon, and green-winged teal--may nest at considerable distances (a mile or more) from the water. Gadwalls show a decided preference for island nesting and when such habitat is available often reach rather high nesting densities. Duebbert (1966) recorded 121 gadwall nests on a seven-acre island in North Dakota.

Mallards and pintails may begin nesting activities by mid or late April, frequently before many of the other dabbling ducks have arrived in the breeding areas. Blue-winged teal and gadwalls are late migrants and often do not begin nesting until three to four weeks after the early nesting species.

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Nests are constructed rather simply, usually consisting of a small ground depression lined with vegetation that can be reached by the hen from the nest site. Later, usually after several eggs have been deposited, the hen plucks down from her breast to add to the nest. Eggs are laid at an approximate rate of one each day. Incubation commences after the clutch has been completed. During the laying of the clutch the eggs often are left unattended, although usually covered by down or vegetation during the duck's absence. Only the hen participates in these activities.

Clutch sizes of surface-feeding ducks range generally from 9 to 12 eggs. Incubation periods may vary from 21 to 28 days, but most fall within a 23-25 day period. Because incubation is not started until the clutch is completed, the entire clutch hatches at approximately the same time. Frequently the female remains on the nest for about a day after the young hatch, during which time the ducklings dry and become responsive to the hen.

Renesting after nest destruction is not uncommon among dabbling ducks (Sowls, 1949; Gates, 1962; Hunt and Anderson, 1966), although it occurs most frequently when nests are destroyed during egg-laying or early incubation. Gates (1962) felt that gadwell renesting occurred often enough to contribute significantly to the overall season's production.

3. Rearing of Young. Ducklings are precocial and are able to leave the nest very shortly after hatching. Newly hatched ducks have a food reserve which would enable them to fast several days, but in most instances the hen leads her brood to water soon after the hatch is complete, and feeding begins immediately. Individual broods usually remain intact, at least until flight is attained, unless they are subjected to excessive crowding or persistent disturbance. Most of the ducks in this group of dabblers attain flight at about 6 to 8 weeks of age, with some of the smaller species attaining flight earlier. After the young have fledged, the hen abandons her brood and begins the post-nuptial molt. During this period she is flightless for approximately three weeks, as in the case of the males. The abandoned fledglings join flocks of other young ducks and of adults that have completed the wing molt.

4. Productivity. The reproductive potential of birds primarily is based on four criteria: (1) the average number of eggs per clutch, (2) the number of clutches per year, (3) age at first breeding, and (4) average longevity or life span of the bird. Of these four criteria, the first is considered to be of major importance. Most ducks, with a clutch size of 9 to 10 eggs, fare quite well in this respect. With the time required to complete and incubate a clutch (5 to 6 weeks) and rear a brood of ducklings (6 to 8 weeks), one successful brood per year is all that a season permits in a temperate zone. The surface-feeding ducks under discussion are capable of breeding as yearling

birds. Although a few banded birds have been known to survive for several years in the wild, the average longevity is much less, probably less than two years. All in all, with the relatively large clutch and first-year breeding, the reproductive potential of dabbling ducks is quite high.

Actual production is always less than the potential. How much less largely depends upon the condition of the breeding habitat. Because such a large number of ducks are produced in the prairie pothole region, one would expect to find a correlation between water conditions there and total waterfowl numbers. The trend data available have shown this correlation to exist. The waterfowl population peaks that occurred in the mid 1950's and the lows during most of the 1960's did in fact correspond to breeding habitat conditions on the prairies. Unfortunately the trend in available breeding habitat has been in a downward direction.

F. Migration and Movements. Extensive seasonal migrations between breeding and wintering areas are characteristic of North American waterfowl, and the ducks of this tribe are no exception. Extensive banding programs have provided most of what is known about migratory patterns. Management of waterfowl in the United States on the basis of four major flyways--the Atlantic, the Mississippi, the Central, and the Pacific--became effective in 1948 (See Illus. 11).

The timing of migrations may vary considerably for different species. Mallards, pintails, and green-winged teal are very early spring migrants, moving north when most bodies of water are still frozen. Mallards, and to a lesser extent green-winged teal, are very late fall migrants, whereas the pintail's fall migration is well underway by late August or early September. Blue-winged teal are very late spring and early fall migrants. As the timing and specific patterns of various species become better defined, more precise management of the waterfowl resource should result. Recent attempts of this nature have been directed toward species management (special teal and mallard drake seasons) and population management (quotas geared to specific populations of geese).

Continued use of a particular segment of breeding habitat is largely perpetuated by the homing tendencies of the birds. Individuals (particularly the females of most waterfowl species) tend to return to the same area in which they nested or were reared the year before. Sowls (1955) felt that the female duck would return to her breeding site as long as the habitat remained favorable for nesting. Because female puddle ducks select a new mate each year, and selection may occur on the wintering ground or enroute to the breeding ground, the male's return location is governed by that of its mate. A high homing tendency has the distinct advantage of maintaining a breeding segment of ducks, although it does slow the process of pioneering "new"

habitats. Nevertheless, dabbling ducks do tend to pioneer new habitat more readily than diving ducks. This difference in dispersal behavior can be attributed in part to the dabblers' greater flexibility in breeding requirements.

Brood movements, even before the young fledge, are not always confined to the body of water first utilized after hatching. In a study of brood movements in Manitoba, Evans, et al. (1952) found that some broods readily moved overland between ponds. Of the dabbling ducks studied, the pintail was the most mobile, followed in order by the mallard, blue-winged teal, and baldpate. Broods of mallards, pintails, and blue-winged teal in eastern Montana moved about 0.4 to 1.0 miles overland and used 2 to 4 ponds per brood (Berg, 1956).

G. Cover Requirements.

1. Nesting. Most ducks of the surface-feeding group prefer to nest in a dry upland cover type, although the mallard, frequently the more versatile member of the group, will occasionally nest over water in dense stands of emergent vegetation. Many studies have noted the variety of different vegetation types utilized by upland-nesting ducks. The vegetation structure of the community seems to be of greater importance than the species composition. Sowls (1955) in southern Manitoba found that ungrazed meadows made up 14 percent of the study area but accommodated 87 percent of the nests found. Of nests found in heavily-grazed pastures, several species of vegetation unpalatable to livestock provided cover.

Sowls also found that the mallard, pintail, and gadwall were more apt to nest at greater distances from water than would the shoveler or blue-winged teal. This trait in itself would provide the first three species with a greater latitude for nest-cover selection. Gates (1962) in Utah found the gadwall selective to dry, dense cover; the pintails, shovelers, blue-winged teal, and cinnamon teal often nested in short, spike-grass cover.

Early nesting species such as the mallard and pintail frequently have to rely on residual cover, but later nesting species often have some new growth from which to select nesting cover. Keith (1961) quantitatively demonstrated this situation in Alberta where 64 and 62 percent, respectively, of the mallard and pintail nests he observed were entirely in old vegetation growth. Comparable data for later nesting blue-winged teal, shovelers, and gadwalls were 36, 24, and 5 percent, respectively.

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Livestock grazing intensities can play an important role in the quality of nesting habitat. Keith (1961) pointed out that the presence of Calamovilfa longifolia, a relatively unpalatable grass to livestock on his Alberta study area, a mixed-prairie community, provided the primary cover for 67 percent of the duck nests found there. He referred to other studies where nesting cover was comprised largely of species (grasses and shrubs) unpalatable to livestock. Thus pasture management practices geared toward homogeneous stands of palatable grasses likely would be disadvantageous to nesting waterfowl.

Although certain dabbling duck species will nest considerable distances from water, all will nest near the water if adequate shoreline vegetation is present to provide nesting cover. Shoreline vegetation can be protected from grazing by fencing, and, in certain cases, by the application of grazing systems specifically designed to enhance this vegetation. However, ungrazed areas of limited size may provide improved habitat for nest predators as well, and thereby result in a net loss in waterfowl production (Keith, 1961).

An alternative to fencing portions of the shoreline for increased nesting cover on small reservoirs would be the construction of small islands. In this case, costs are limited largely to initial expenditures which need not be large if incurred when the reservoir is being constructed. Several authors have noted increased nesting success on mammal-free islands. In addition, minimal grazing along the shore, at least during the normal high-water period in the spring and early summer, would aid in promoting a vigorous stand of cover.

2. Brood Rearing. Preferred brood-rearing areas may take on different aspects, in each case providing security and food, but in varied ways. Sowls (1955) found large, flooded fields of white top to be the favored brood rearing areas for surface-feeding ducks. Here food and cover were obtained from the flooded dense vegetation, and protruding hummocks provided the necessary loafing areas. Evans, et al. (1952) in pothole country found that large open areas with sage or bulrush cover along the edges were preferred brood habitat. Berg (1956) found a similar preference in a stock-pond habitat where shoreline vegetation and larger pond size were factors contributing to preferred brood ponds. Thus, a shallow area with extensive vegetation or a deeper, larger pond with only shoreline vegetation each provides the desired security.

Mobility of broods increases as they grow older, even before flight is attained. After a brood has fledged, there is a preference for larger, open ponds, additional justification for diversified pond types in good brood habitat.

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3. Migration and Wintering. During the breeding season, pairs of the same species tend to be dispersed widely over the available nesting habitat because of the territorial demands of each pair. During other times of the year, the reverse is true and most species of dabbling ducks are quite gregarious. As a result, a unit of migration or wintering habitat can accommodate many times the number of ducks than an equivalent unit of breeding habitat can support. Frequently a large segment of the continent's total population concentrates in a relatively small area. Also, although populations of ducks traditionally use the same flight corridors and stopover areas, the tie to specific wintering habitat does not seem to be as rigid as to breeding habitat. Thus, large numbers of mallards may winter as far north as the presence of open water and food supplies permit. Many of the refuges and management areas, both State and Federal, were located intentionally in strategic areas to provide migratory and wintering habitat for large concentrations of waterfowl.

Cover requirements thus are not so critical during the migratory and wintering seasons, reducing basically to adequate resting and feeding areas. Marshes and open waters with emergent vegetation remain the prime habitat utilized. Yet, supporting the huge concentrations of waterfowl that frequently occur on certain wintering grounds requires both large bodies of water and large supplies of food. These requirements are becoming increasingly difficult to supply in some areas of the west due to ever increasing human demands for water and agricultural products, with the subsequent continued loss of wetlands.

H. Food Habits. The relative utilization of plant and animal food by dabbling ducks is summarized in Table 1. The listing of plants (exclusive of cultivated grains) notes only the major plant groupings, such as sedges, pond weeds, etc.; a listing by species would be too voluminous to be included here. Animal food consists mostly of insects and various aquatic invertebrates. Occasionally, however, fish carrion can be an important food item--for example, mallards feeding on dead salmon along streams in Alaska and the Northwest. This summary reflects largely the feeding of adult ducks during the Fall. Ducklings of all the species represented would show a much higher percentage of animal (mostly insects) matter in the diet, especially during the first few weeks of life when a higher protein intake is quite essential to rapid growth.

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Table 1. Summary of food habits (primarily Fall) of eight species of dabbling ducks (Kortright, 1943).

Species	Percent Plant/Animal	Major Plant Items (Exclusive of cultivated grains)
Mallard	91/9	Sedges, grasses, smartweeds, pond weeds, duck weeds
Pintail	87/13	Pondweeds, sedges, grasses, smartweeds
Gadwall	98/2	Pondweeds, sedges, algae, coontail, grasses
Am. Widgeon	93/7	Pondweeds, grasses, algae, sedges, wild celery
Shoveler	66/34	Primarily seeds (sedges, pondweeds, grasses)
Blue-winged Teal	71/29	Sedges, pondweeds, grasses, smartweeds, algae
Cinnamon Teal	80/20	Sedges, pondweeds, grasses, smartweeds
Green-winged Teal	91/9	Sedges, pondweeds, grasses, smartweeds, algae

The importance of aquatic and semi-aquatic plants in the diet of dabbling ducks is very apparent. Only the shoveler and the blue-winged and cinnamon teal drop away noticeably from a level of 90 percent plant materials making up the diet. Not considered above, but very important seasonally, is the upland feeding on domestic grains, particularly by "stubble ducks"--mallard and pintail. Frequently such feeding is accomplished on waste grain but under certain conditions considerable damage is done to grain crops. The various cultivated grains (e.g., wheat, corn, and rice) are becoming ever more important as food for waterfowl along the migration paths and on the wintering grounds. The locations of such food sources can influence greatly the spacial and temporal distribution patterns of the birds.

Most of the aquatic feeding is accomplished by tipping. American widgeons quite frequently associate with diving ducks or coots and feed on plant materials brought to the surface by these birds. Shovelers and blue-winged teal generally surface-feed more than the others, which accounts in part for the greater amount of animal food found in the diet. The shoveler, with its specialized straining-type bill, does more bottom feeding in the shallow waters than the other ducks of this group.

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I. Limiting Factors.

1. Breeding Habitat. There seems little question that the single most serious factor limiting the waterfowl population (excluding geese) is breeding habitat. As has been mentioned earlier, the most important production areas are located in areas being subjected increasingly to intensive agricultural practices. Subsidized drainage programs have taken and continue to take their toll. Programs to purchase and lease wetland areas have been underway in recent years but fail to offset the downward trend. Loss of breeding habitat with diversified water types has even more drastic effects on the diving duck species than on the more adaptable dabbling ducks. In short, duck populations closely parallel the quality of the breeding habitat.

In contrast to areas which are farmed and subjected to continued intensive drainage programs, areas used primarily for livestock grazing hold some promise for the improvement of waterfowl breeding habitat. Although this grazing type generally is not as basically productive as the agricultural type, being usually in a lower rainfall area, the major land use is in less conflict with waterfowl production. Much of this land is located in the western states and is in public ownership. Although many stock-water reservoirs have been built on such lands in the past, recent modifications of grazing management such as rotational grazing systems, dictate an accelerated reservoir building program. The precise waterfowl response to rotational grazing is as yet an unknown. However, the increased number of water areas is a more favorable trend than that which is present in the agricultural areas. Further improvement could be expected if certain basic features were included in construction (shoreline irregularities, island construction) and if grazing practices prevented complete loss of shoreline vegetation.

2. Migration and Wintering Habitat. At the present time adequate waterfowl habitat exists along the migratory flight paths and on the wintering grounds. Nevertheless, it should be emphasized that such habitat is essential to the continued existence of large waterfowl populations. The maintenance of any given population level--either in total waterfowl or in an individual waterfowl species--requires that a certain minimum number of breeding birds survive the winter and return northward to raise new young. More than half of the average duck's life cycle is spent in areas outside the breeding grounds. Yet here, too, there has been a continued reduction in the total acreage available. Destruction of important waterfowl areas in Mexico is one factor causing greater numbers of birds to winter farther north. Increased wintering concentrations tend to magnify both the conflicts with agriculturists and the overall wintering mortality. Consideration must be given to preserving adequate migratory and wintering areas, especially on lands encompassing the Pacific and Central flyways, where wetlands are apt to be more scarce and at a premium for a variety of uses.

3. Weather and Production. Weather has a great deal of influence on waterfowl production. Most of the breeding areas (i.e., the small ponds) are dependent on runoff for their continued existence. Late summer and fall rain not only places water in the ponds but provides a saturated soil and a good frost seal, which in turn aids in providing a good runoff from snow melt the following spring.

Spring rains, which help maintain ponds through the summer, can have disadvantages if excessive, or if accompanied by prolonged cold spells. Such a combination often disrupts the first attempts of early nesting mallards and pintails, and forces them into a less productive second attempt.

4. Food. Except in rather drastic situations, food is seldom a critical factor with waterfowl. Evans, et al. (1951) felt that food was not of great importance in the selection of ponds for brood use. Keith (1961) felt certain that there was no shortage of plant or animal food in most of the impoundments which he studied in southeastern Alberta. He also questioned the need for artificial planting of food plants because a great variety rapidly pioneered new water areas.

Waterfowl adapt readily to changing food conditions. Occasionally, during severe storms, birds may lose their food source suddenly and suffer for a period. This problem is particularly evident in areas where ducks (e.g., mallards) winter at northern extremes.

5. Diseases and Parasites. Various pathological factors can cause substantial losses to waterfowl at certain times. The two most noteworthy maladies which occur in duck populations are botulism and lead poisoning.

Botulism, or western duck sickness as it initially was called, has occurred in many places in the United States but the greatest incidence has been in states west of the 100th meridian. The organism causing the malady is the bacterium Clostridium botulinum, Type C. It lives in the external environment and does not itself infect the duck. Rather, when the organism multiplies it produces an endotoxin which is ingested by the victim, absorbed into the blood stream via the digestive tract and acts in an adverse fashion on the nervous system. Symptoms of this poisoning in ducks include a general loosening of feathers, paralysis of the neck ("limber neck"), and paralysis of the nictitating membrane of the eye. The exact conditions under which a botulism outbreak will occur are difficult to predict. Generally outbreaks occur on shallow, alkaline-type water areas. Outbreaks most commonly occur in warm periods, from late July to mid-September. Because the production of toxin seems greatest on the shallow, "feather edges" of a moderately sloping shoreline, the dabblers which

feed in such an area are most susceptible. An anti-toxin has been developed but individual handling of ducks in a severe outbreak is not practical. Usual remedial measures consist of gradually lowering the water level to eliminate a stable "feather edge," rapidly raising the water level against a steep bank, or actually driving the ducks out of the area by means of planes or airboats.

Lead poisoning is a mortality factor brought about as a side effect of hunting. In heavily hunted areas, spent shot is deposited in the bottom of water areas and later picked up by ducks in the process of feeding. Extensive work on this problem by Bellrose (1959) showed incidence of lead shot was highest among waterfowl in the Mississippi flyway and lowest in the Central, and that deaths occurred in greatest numbers in late fall and winter, after the hunting season. The mallard has been the principal species involved in the Mississippi flyway and the pintail in the Pacific. Feeding habits influence somewhat the incidence of lead shot occurring in different species, with the species feeding on leafy vegetation such as the American widgeon being less prone to ingest shot. As lead is ingested and acted upon by the grinding action of the gizzard, the soluble lead salts pass into the digestive tract and the blood stream. The gizzard becomes paralyzed, food intake lessens, weight losses occur, and, if the case is severe, starvation results.

Another disease, fowl cholera, can occur in rather drastic proportions within a waterfowl population. This malady, caused by a bacterium, was known in domestic fowl for years, but was first identified in wild ducks in California in 1944. The disease in varying degrees of intensity has occurred in parts of California and Texas. Insufficient information is available on outbreaks of fowl cholera to implement control measures. As might be expected, spread of the disease is favored by dense concentrations of waterfowl.

It is difficult to assess the overall effects of disease and parasites on year-to-year population trends. As waterfowl management becomes more intensive, habitat more restricted, and populations more critical, these mortality factors will require more detailed attention and study.

6. Predators. Many instances have been reported of seemingly severe predation occurring on waterfowl during the nesting period. Most of these are of a local nature and have included a wide range of predators--from bull snakes and skunks feeding on eggs to northern pike and mink preying on young. Locally, predation for a given year may appear quite high. The difficulty arises in assessing how the stage may have been set from the previous year(s) or what adjustments may be made in the following year(s). For a good resume of this aspect, see Errington (Linduska, 1964). At present, predation is not considered to be a major factor affecting population levels of waterfowl species.

7. Hunting. North American waterfowl are very popular sporting birds. Their migratory habits may subject a given population to several months of gunning pressure from Canada, through the United States, to Mexico and even to South America. Unlike a resident population of upland game, a given population of waterfowl may be exposed to several "opening days," at which time the greatest number of enthusiastic gunners are afield. Young birds particularly are affected; they are in their first migration, moving into "new" habitat as they progress south, which may place them at a short-time disadvantage. On the other hand, some of the same self-governing features of a resident game bird harvest seem to apply to waterfowl harvests. Low duck numbers and restricted seasons reduce the number of hunters, as has been demonstrated by duck-stamp sales in recent years. Additionally, to a certain degree the hunter harvest substitutes for deaths which otherwise would occur in waterfowl as the result of other mortality factors. (Bellrose and Chase, 1950).

The basic mechanics have been established for governing harvest in the three countries primarily involved with North American waterfowl. Certain populations of geese are defined sufficiently well now to permit annual harvest quotas to be established and distributed between the political areas involved. Species management, a harvest technique recently enlarged upon, permits a liberalization on more abundant species and hopefully curtails the harvest on the less numerous species. With more refined data being gathered each year, it would appear that shooting regulations could be put into effect which would best utilize the populations present--populations which are determined largely by the quality and quantity of the breeding habitat.

DABBLING DUCKS (Tribe Anatini)

Illus. 1. Primary breeding range of North American waterfowl

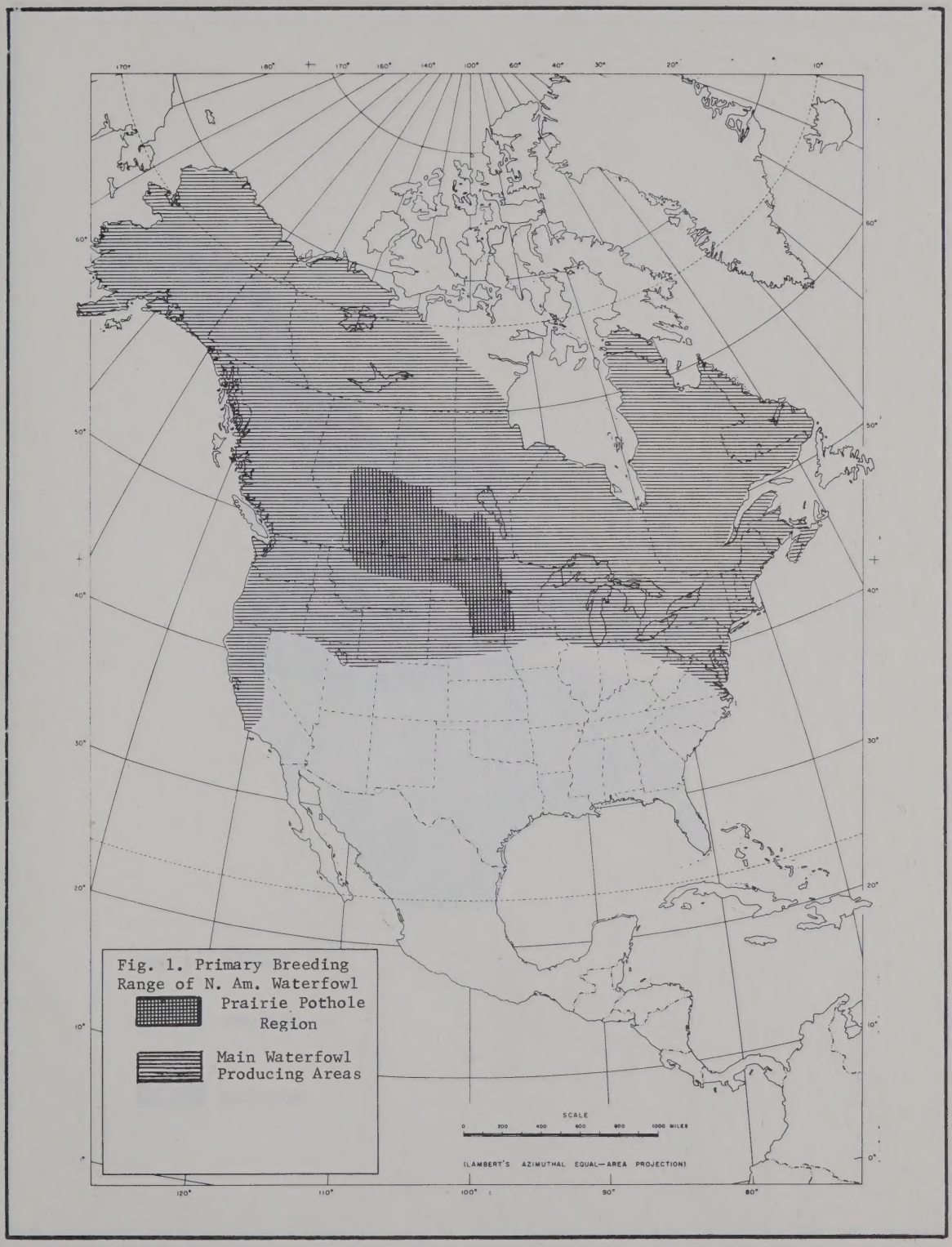
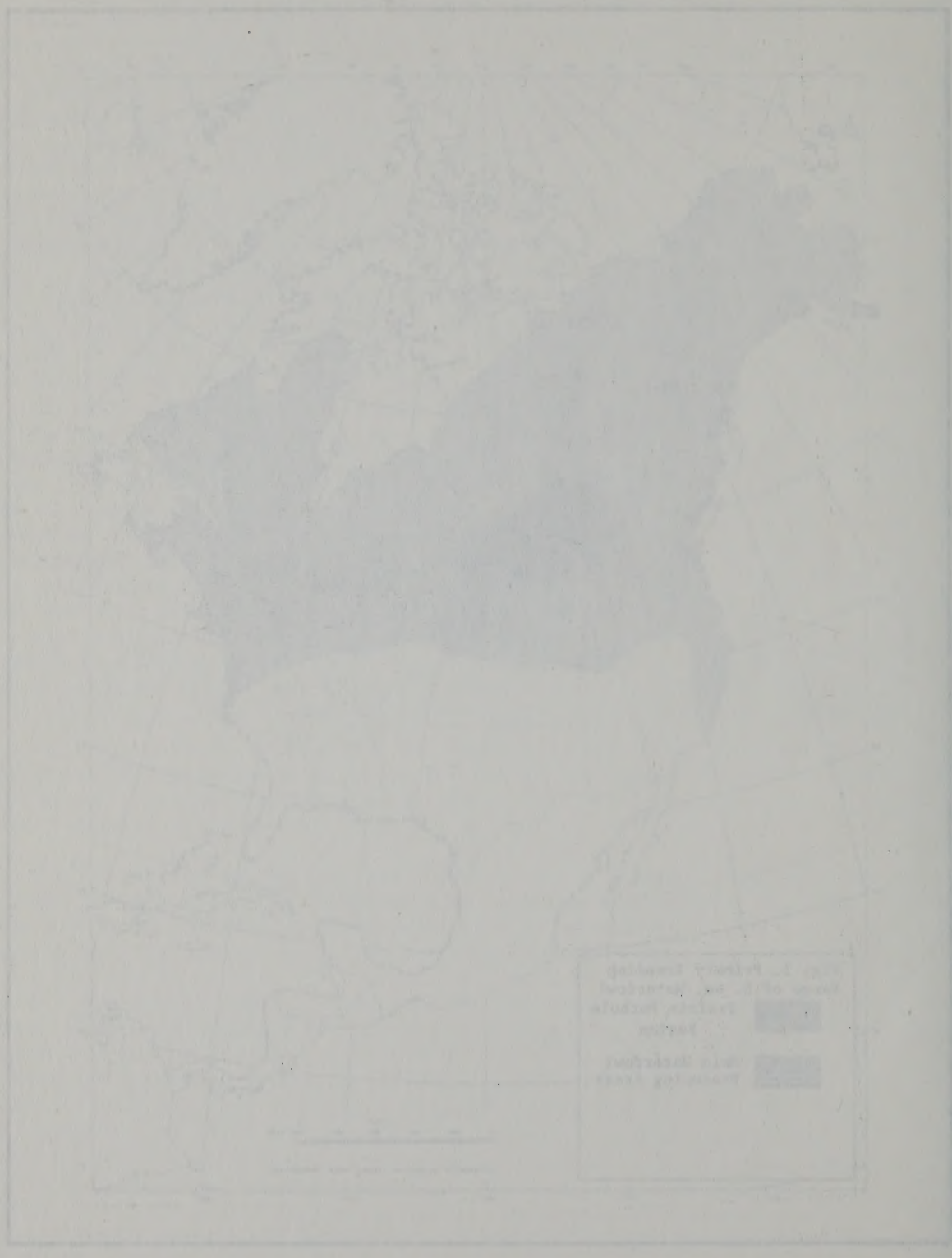
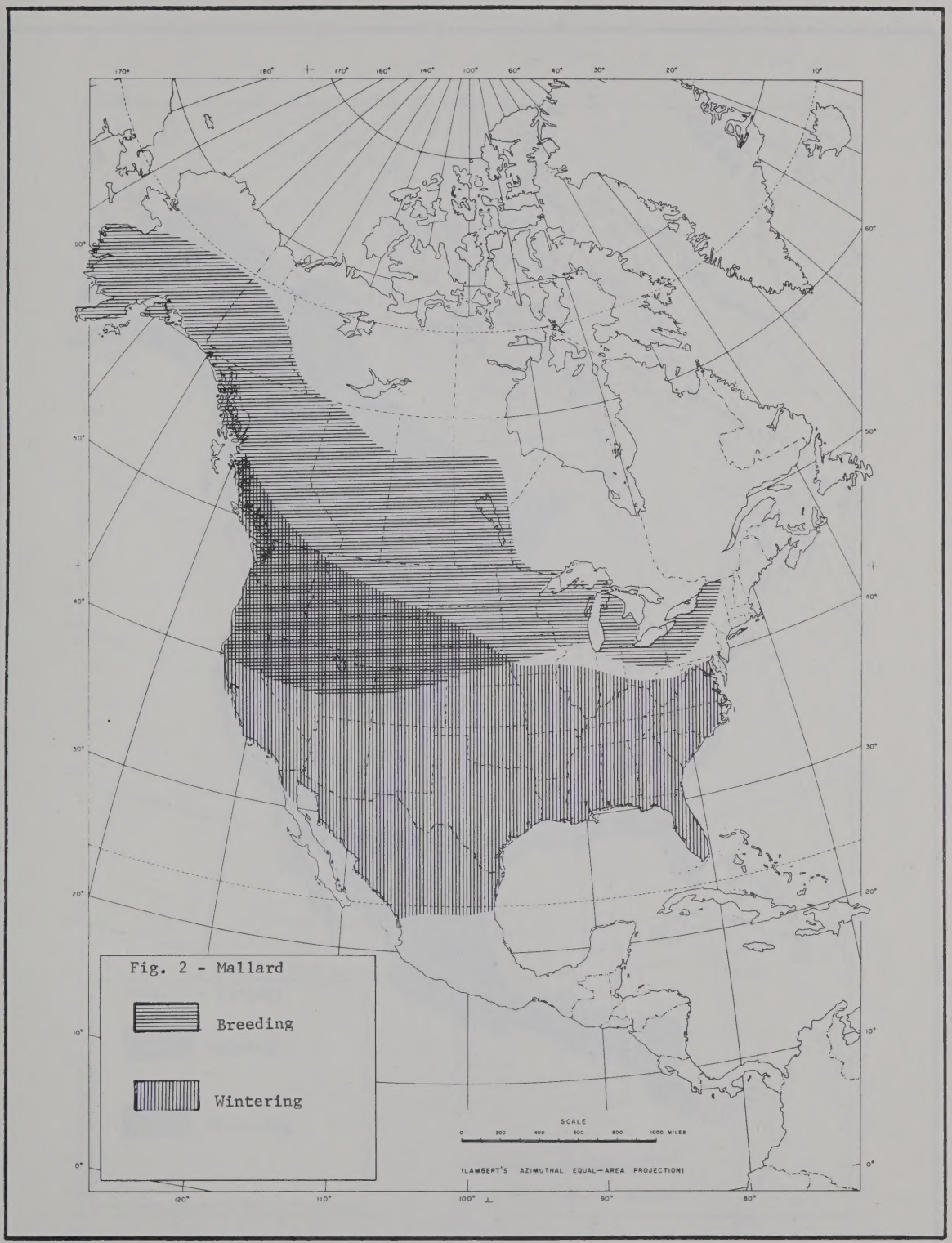


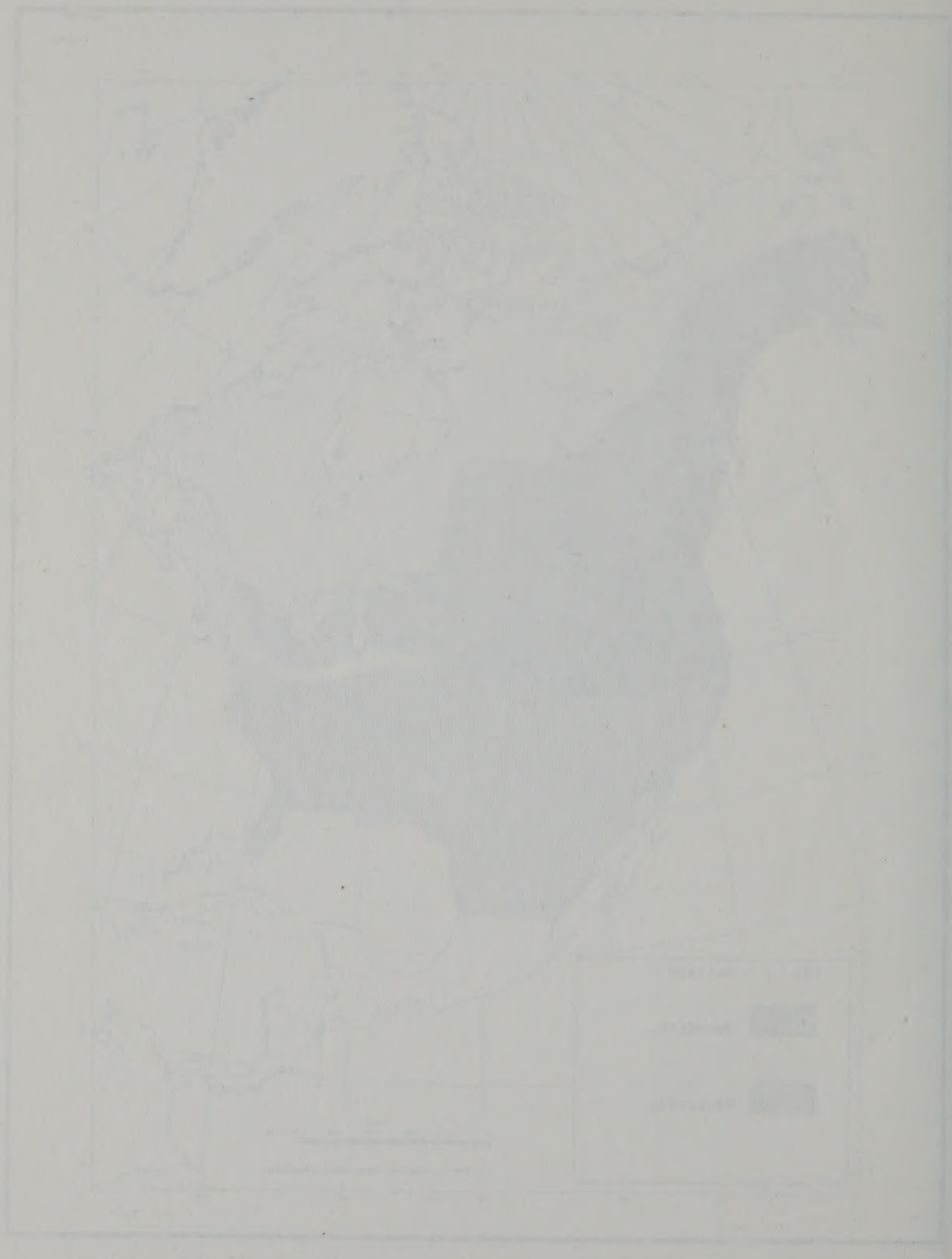
Fig. 1. Primary Breeding Range of N. Am. Waterfowl
Prairie Pothole Region
Main Waterfowl Producing Areas
SCALE
0 200 400 600 800 1000 MILES
(LAMBERT'S AZIMUTHAL EQUAL—AREA PROJECTION)



DABBLING DUCKS (Tribe Anatini)

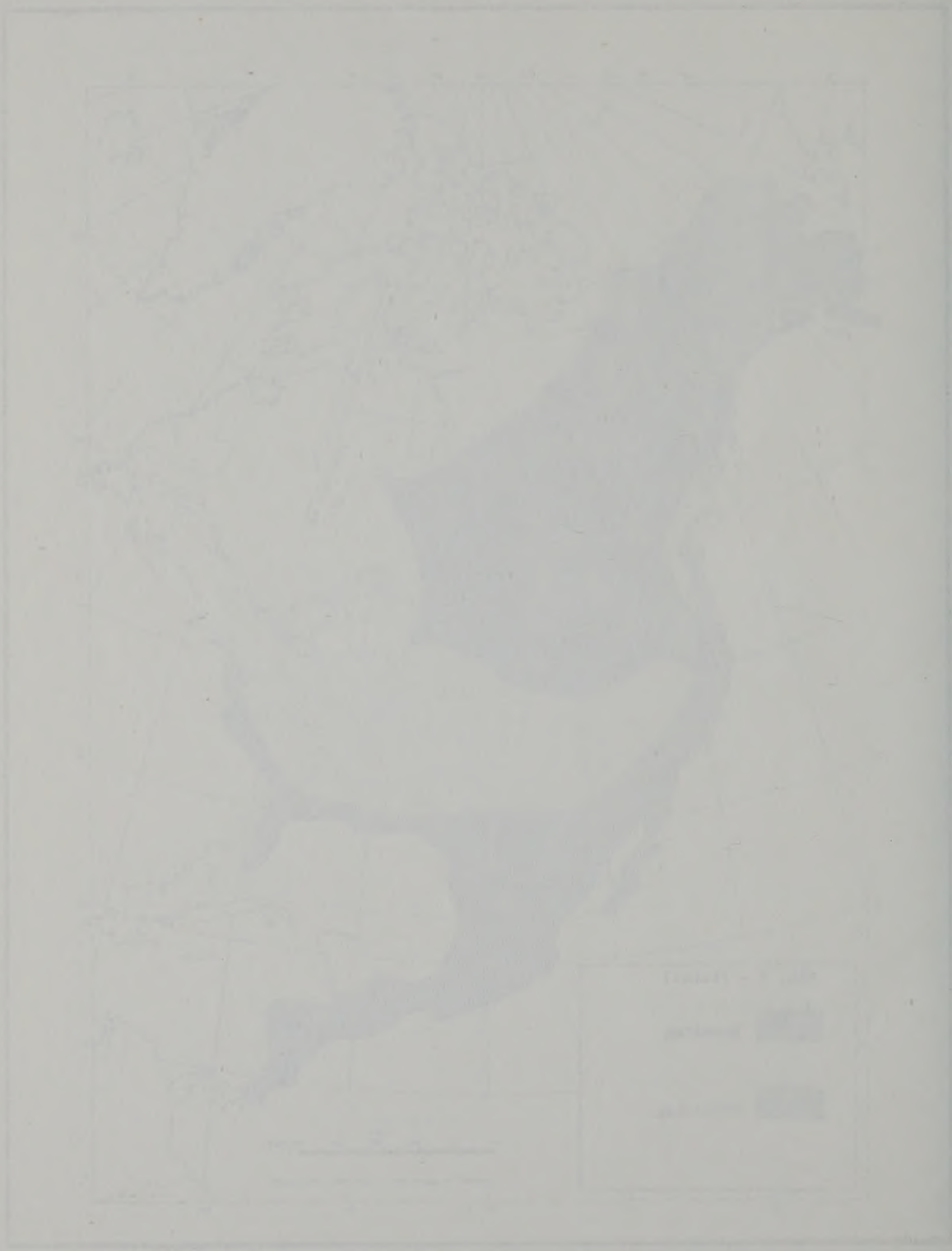
Illus. 2. Principal range of the mallard





DABBLING DUCKS (Tribe Anatini)

Illus. 3. Principal range of the pintail

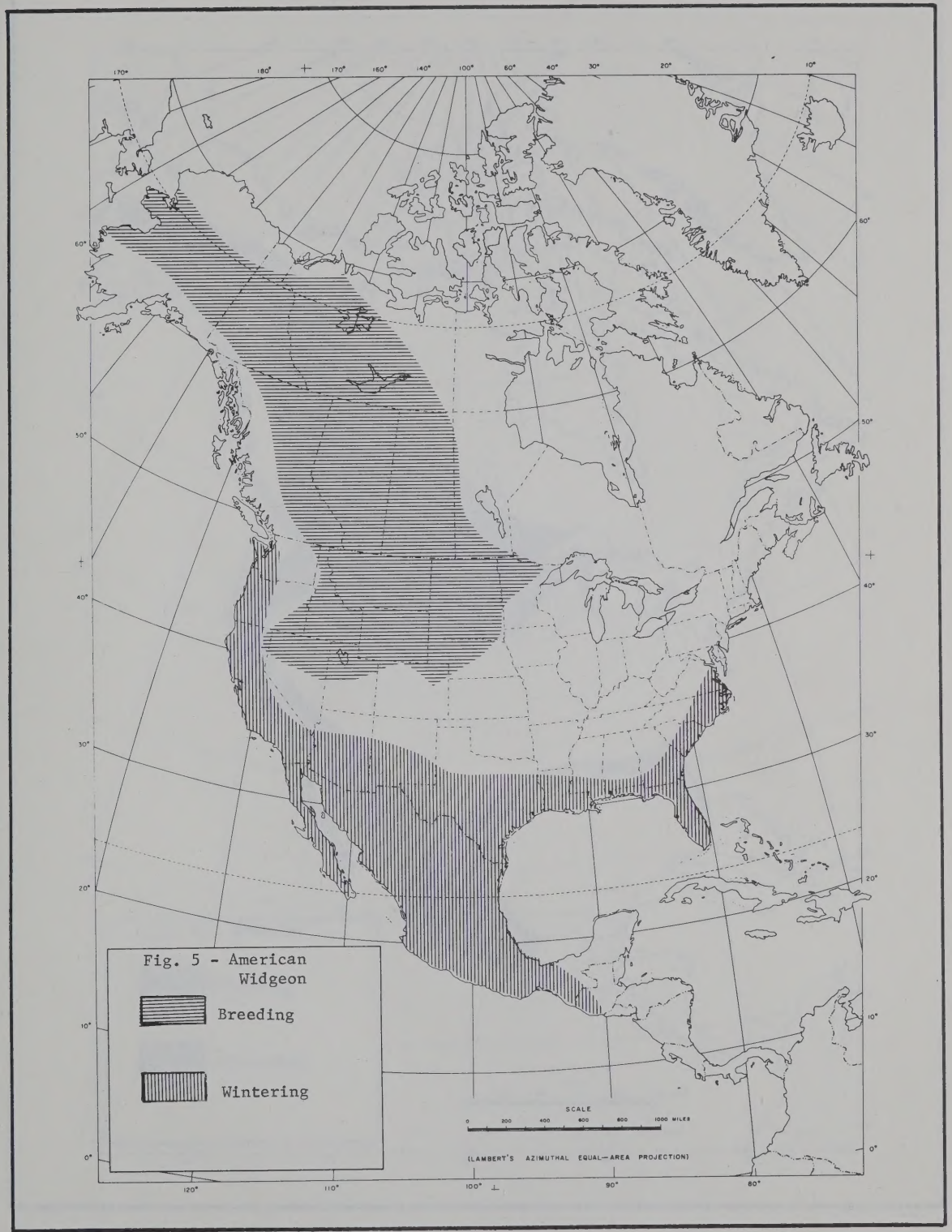


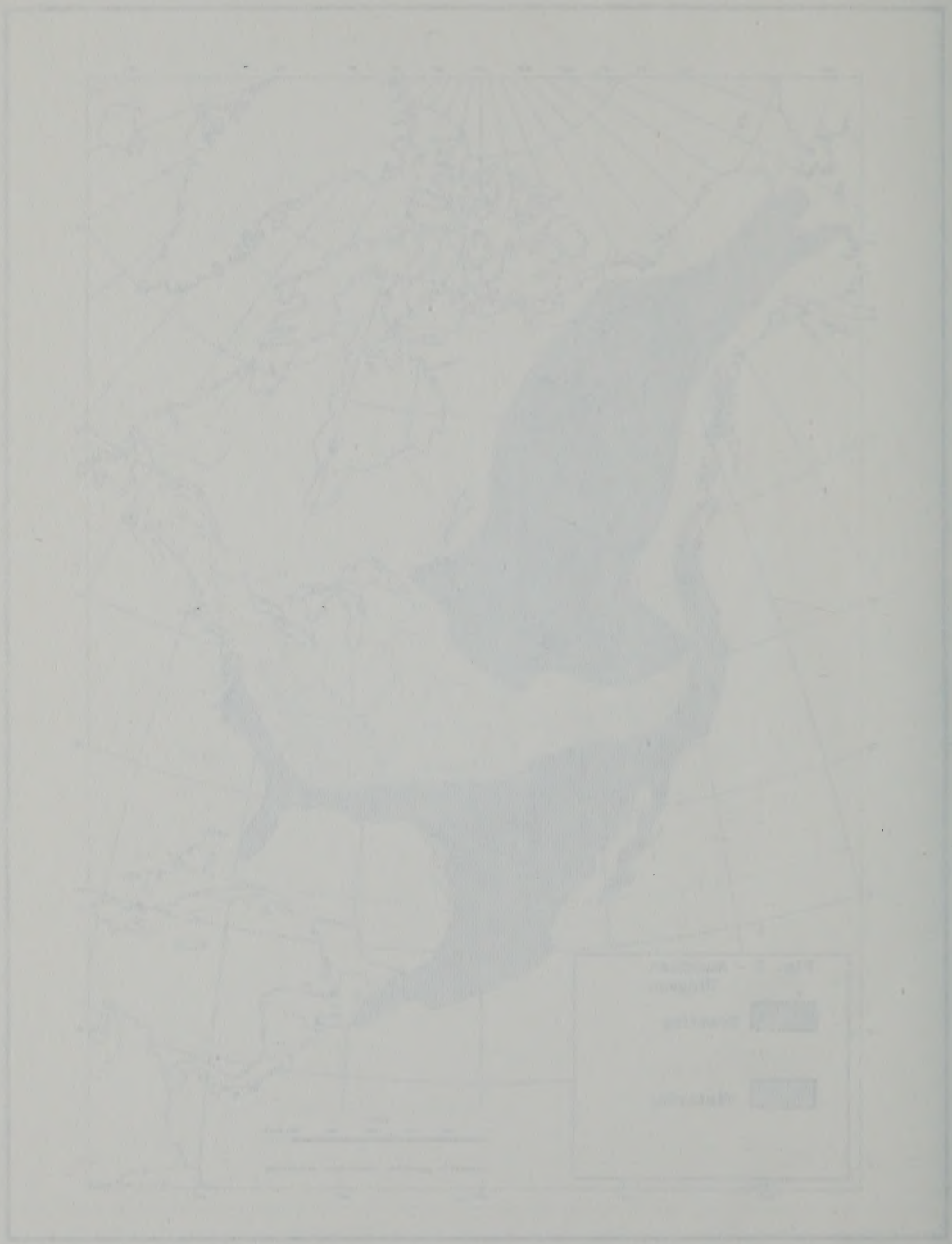
DABBLING DUCKS (Tribe Anatini)

Illus. 4. Principal range of the gadwall

DABBLING DUCKS (Tribe Anatini)

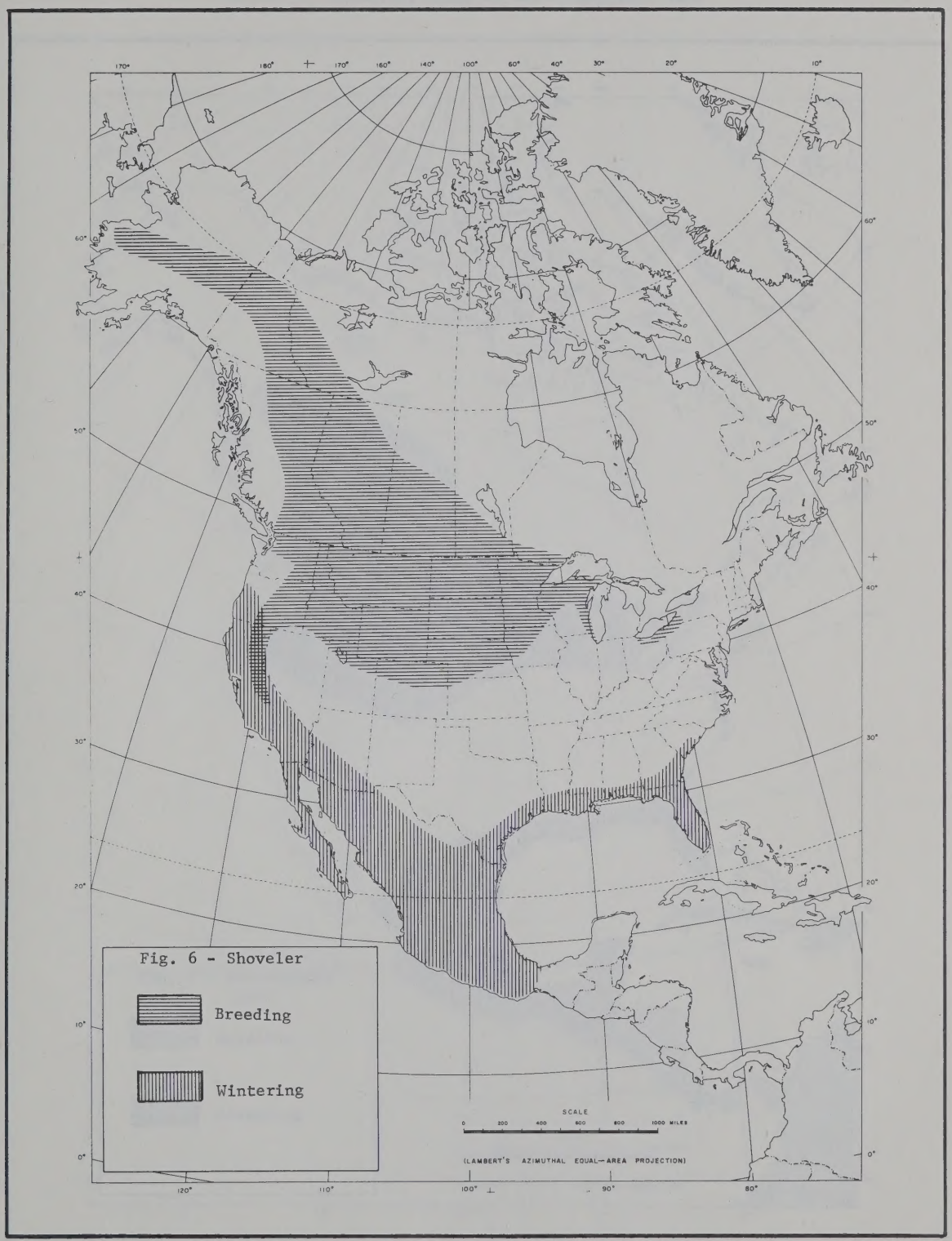
Illus. 5. Principal range of the American widgeon

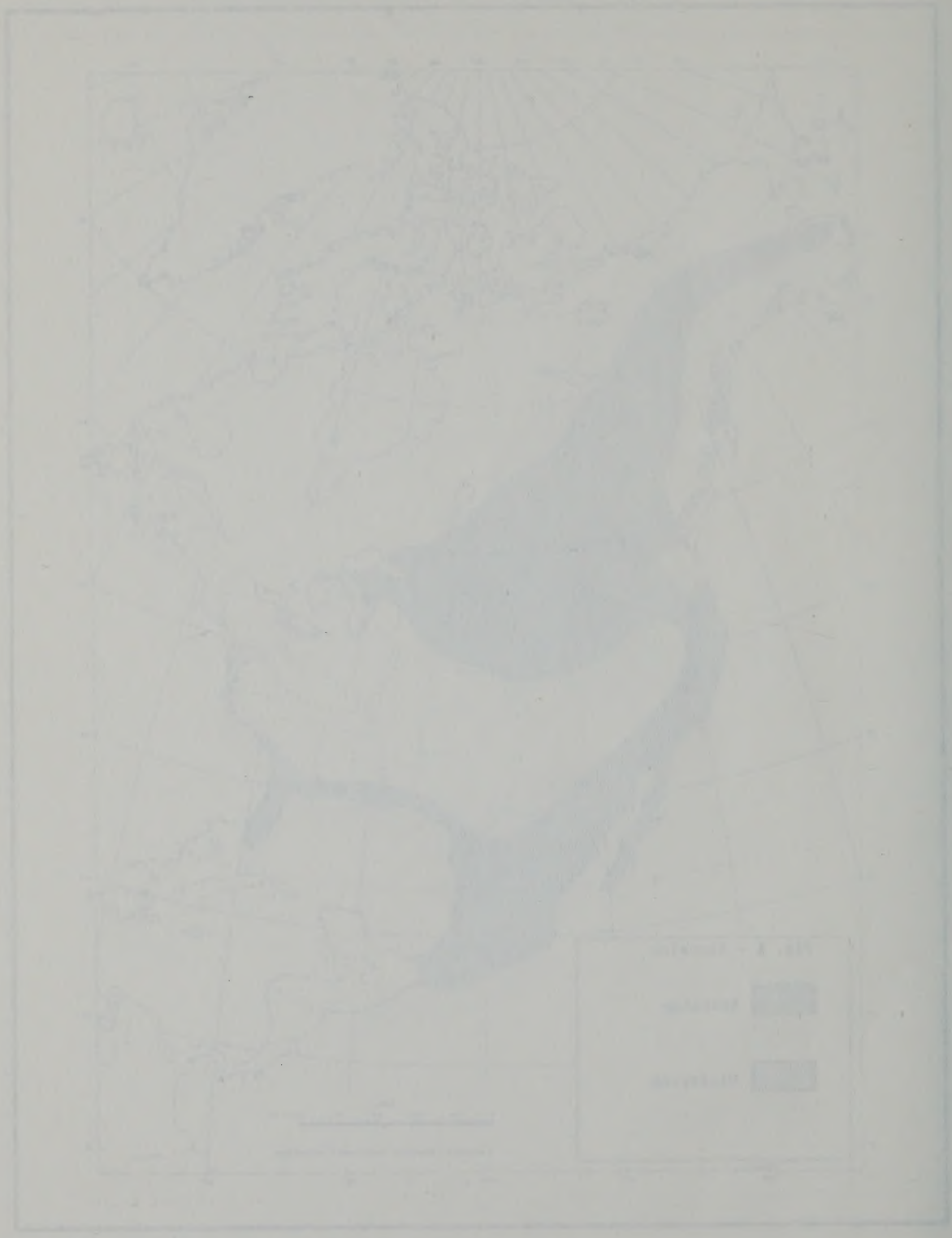




DABBLING DUCKS (Tribe Anatini)

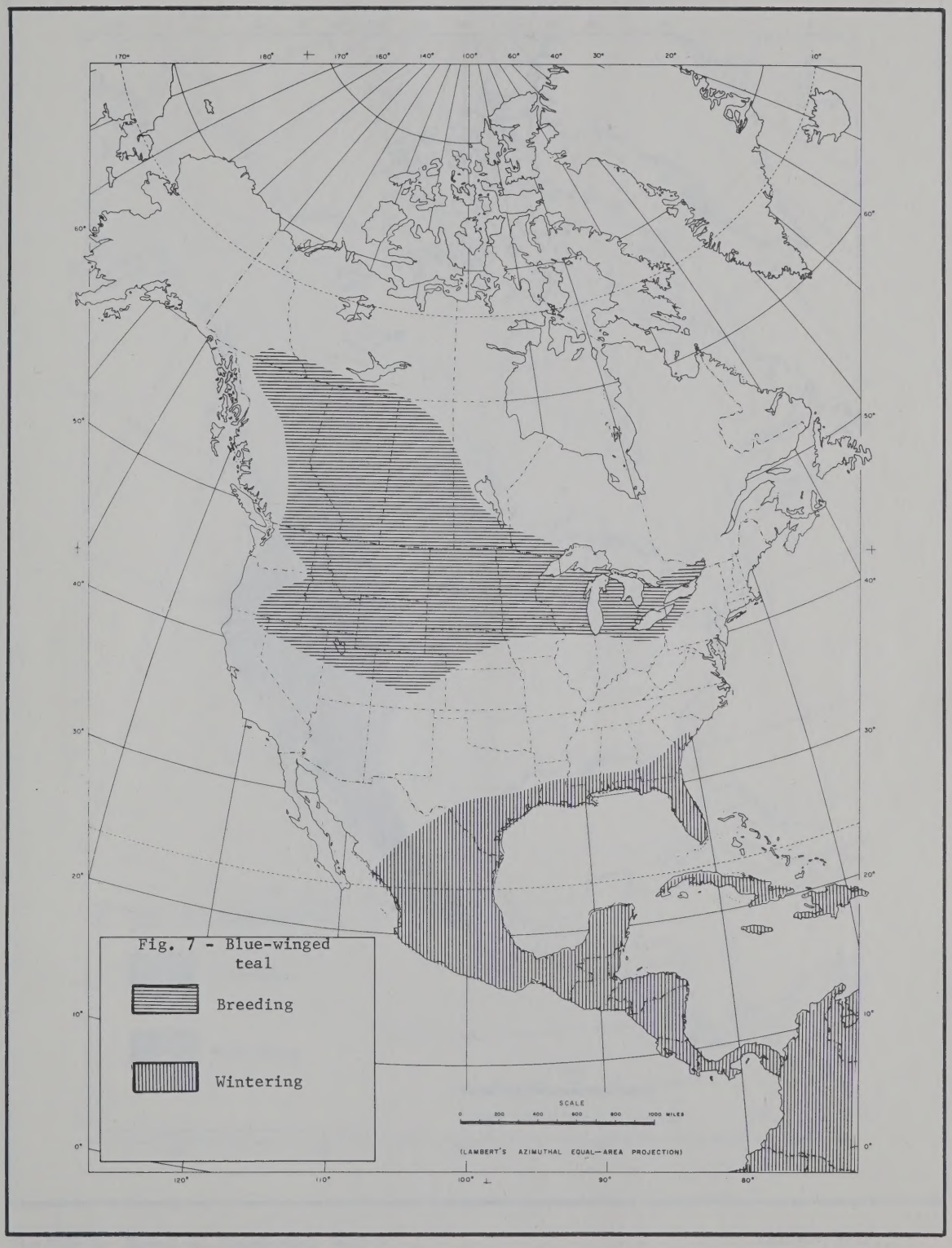
Illus.6. Principal range of the shoveler

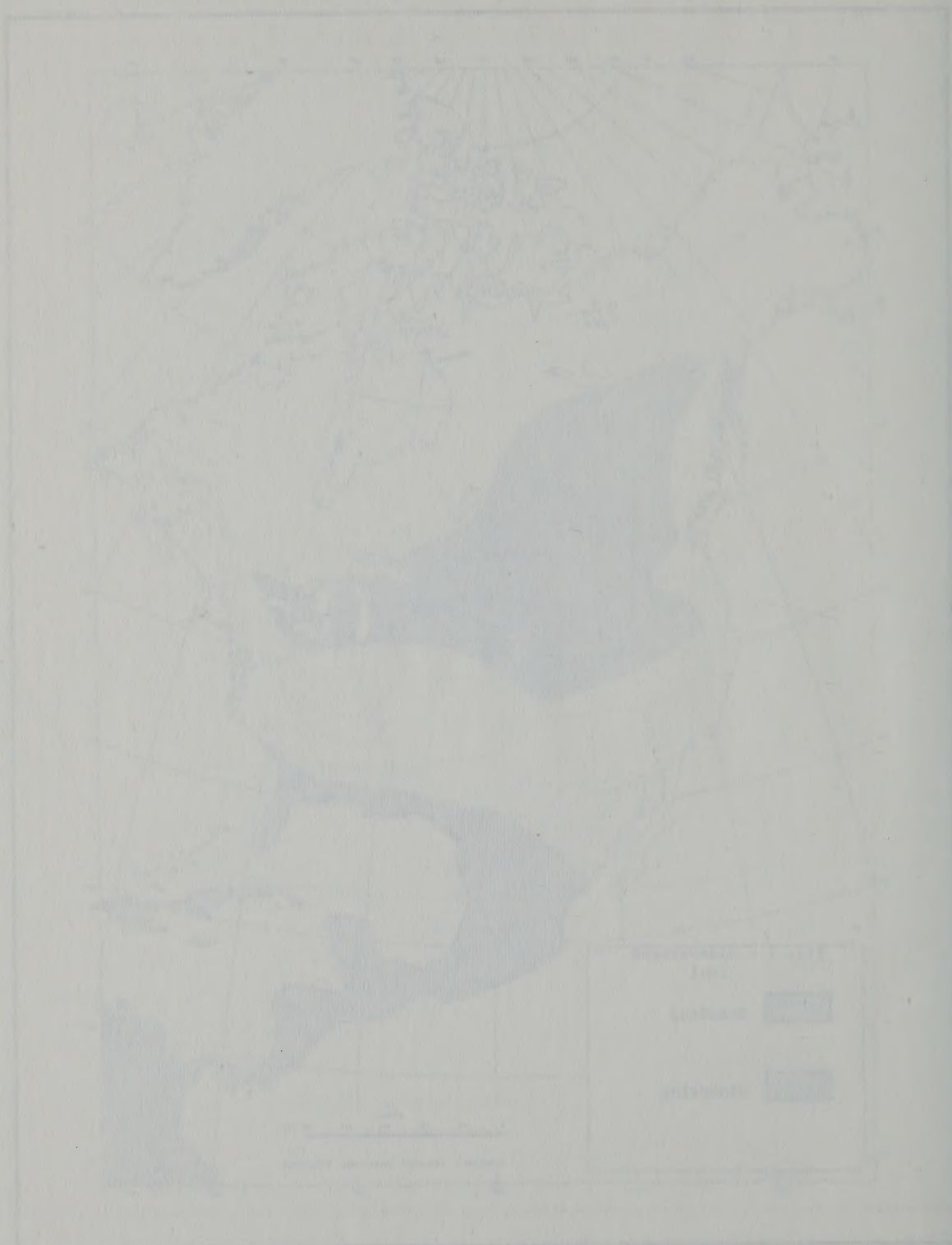




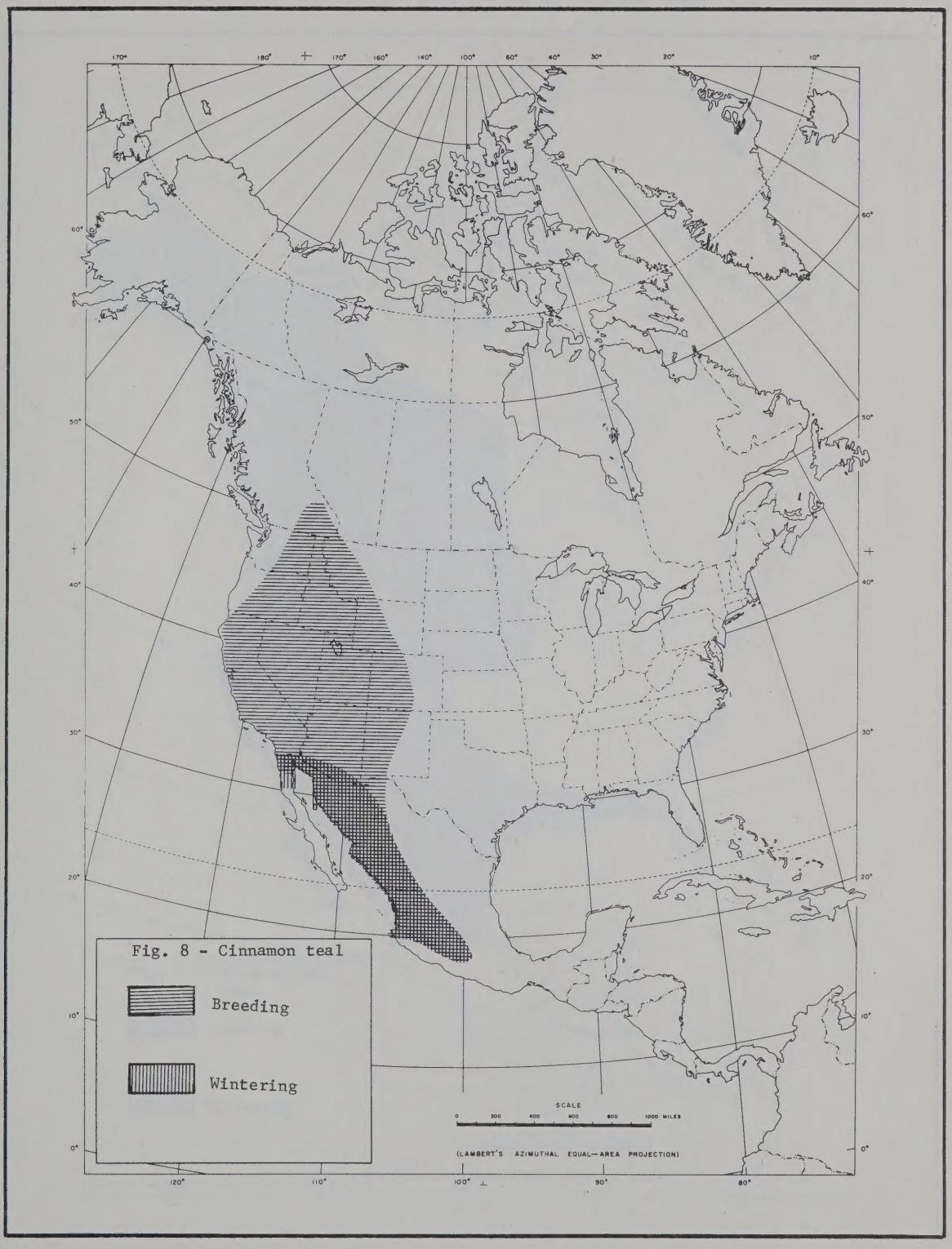
DABBLING DUCKS (Tribe Anatini)

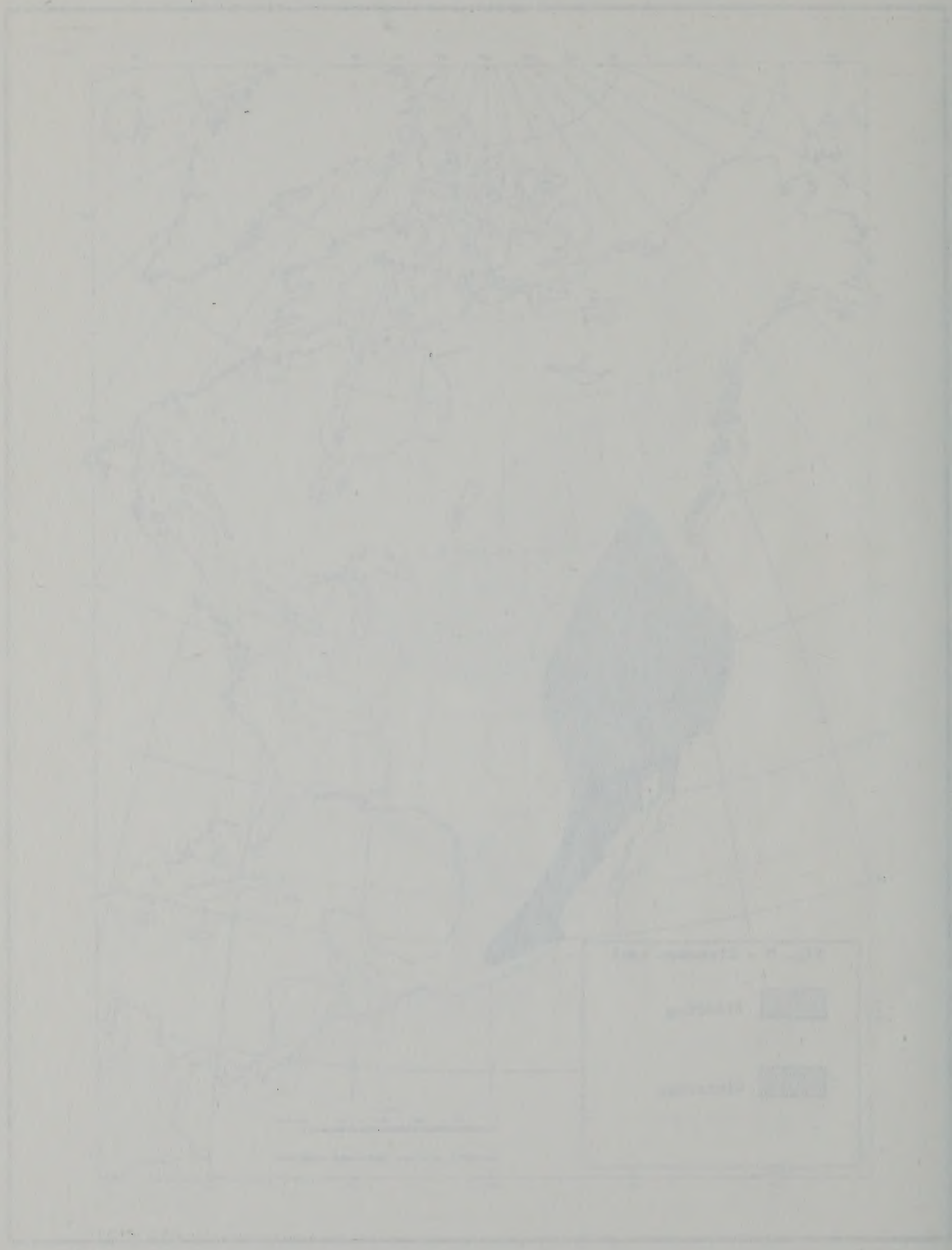
Illus.7. Principal range of the blue-winged teal





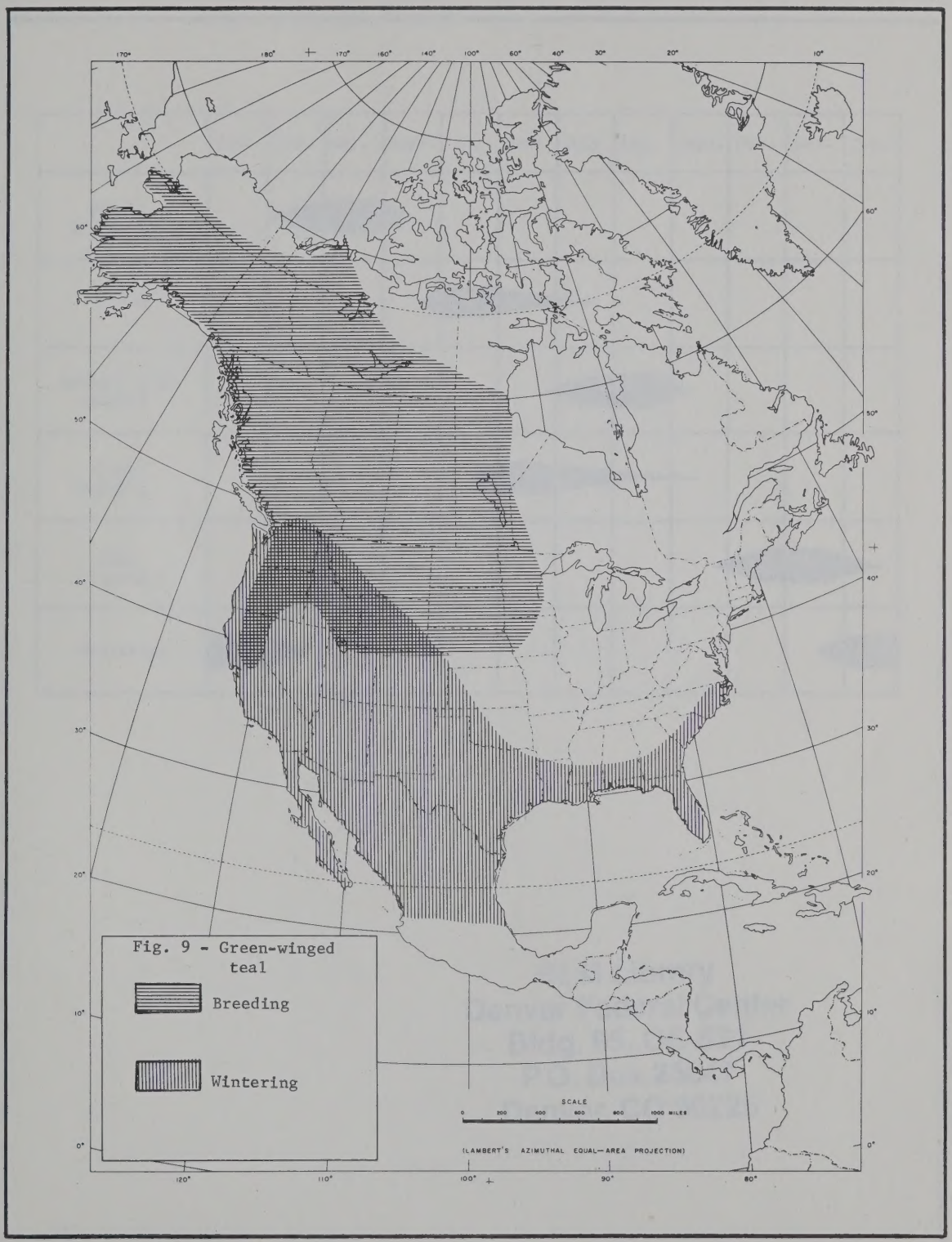
Illus. 8. Principal range of the cinnamon teal

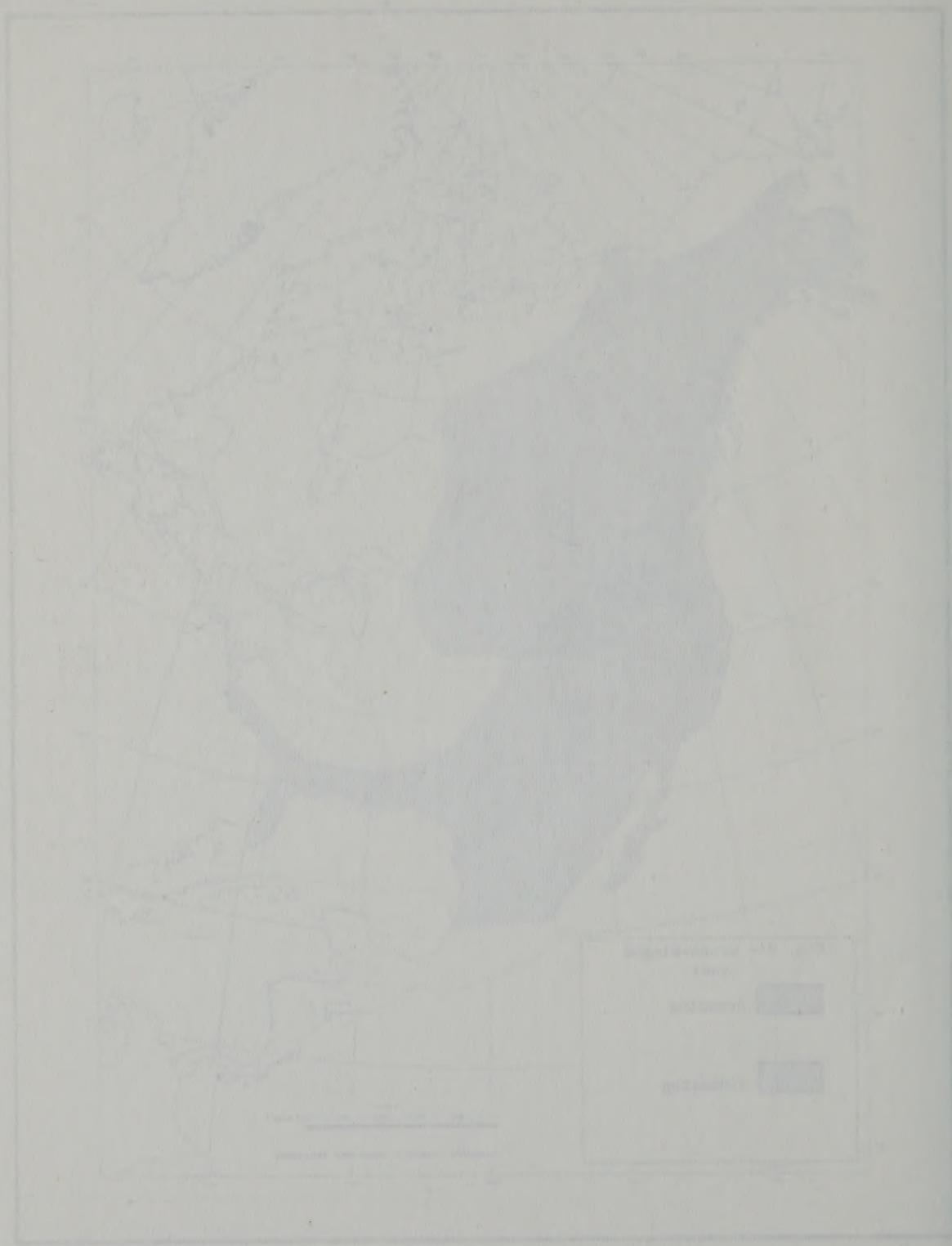




DABBLING DUCKS (Tribe Anatini)

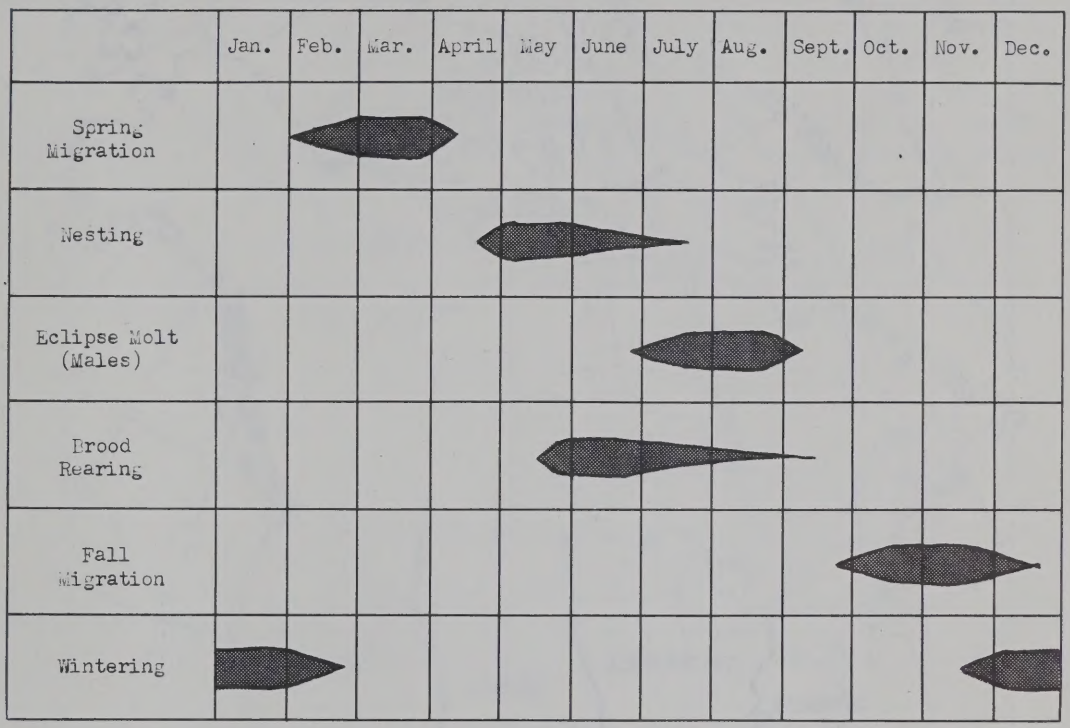
Illus. 9. Principal range of the green-winged teal





DABBLING DUCKS (Tribe Anatini)

Illus. 10. General sequence of seasonal activities for surface-feeding ducks



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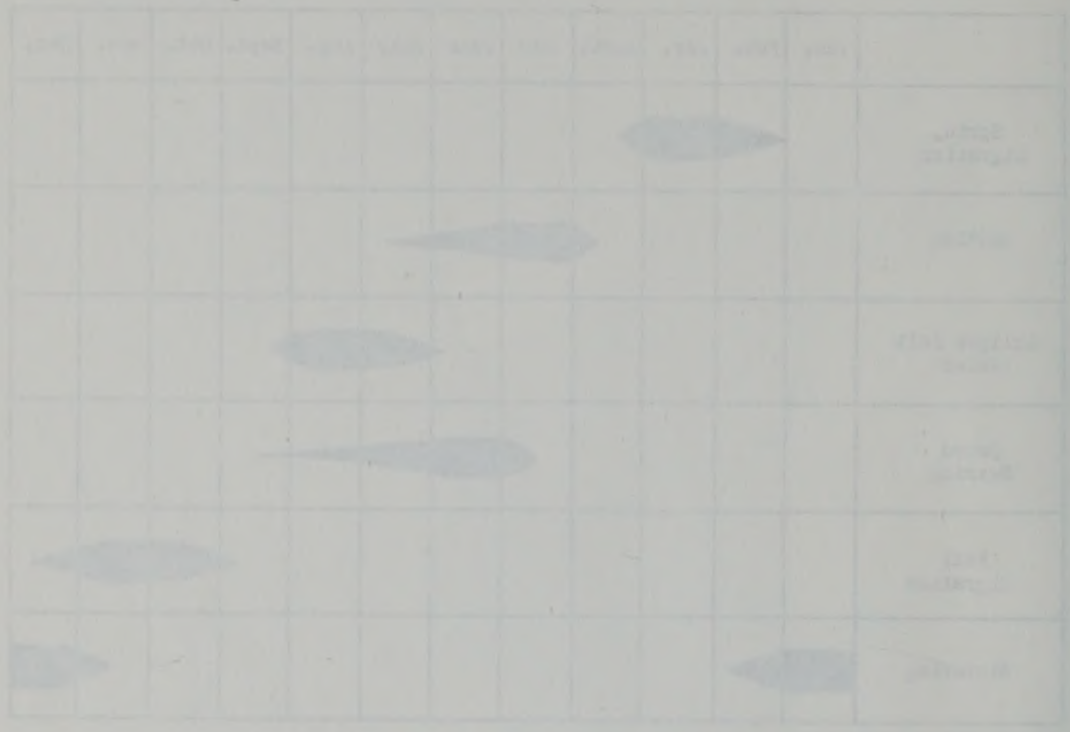

DABBLING DUCKS (Tribe Anatini)

Illus. 11. Administrative waterfowl flyways in the United States

Figure 11. - Administrative waterfowl flyways in the United States.

DABBLING DUCKS (Tribe Anatini)

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